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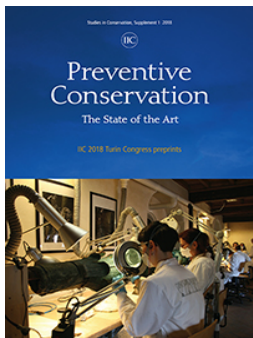
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# Managing Uncertainty for Preventive Conservation

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## ABSTRACT

This paper examines how conservators engage with uncertainty when creating preventive conservation strategies. It argues that by recognising contexts in which uncertainty will be encountered conservators can develop effective management strategies. A typology of uncertainty explores a range of categories of uncertainty, their experience in preventive conservation and identifies distinct approaches to manage them. Managing uncertainty may include acts of defining its parameters, exposing and resolving through communication or protecting from with contingency. Whatever approach is adopted it must be accepted that uncertainty cannot be avoided. It is important therefore to aim to live well with uncertainty and the paper advocates for preventive conservation applications of strategies recommended in health care for patients with life-threatening illnesses. These strategies include working on things that can be controlled, goal setting, acceptance and factoring in emotions. The ability to identify contexts in which uncertainty is inbuilt should trigger those concerned with preventive conservation to activate strategies developed for managing and living well with uncertainty.

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Uncertainty; decision-making; preventive conservation; innovation; collaboration; collection management

## Introduction

Understanding and being able to effectively articulate and utilise uncertainty has the potential to increase influence, improve collaboration and lead to better preventive conservation practice. The aim of preventive conservation is to minimise future loss, so the concept of the *future* is critical. Preventive conservators adopt strategies such as risk management or collection condition surveys to review past conditions, current risks and prepare for the future. We use data about past and current conditions to make defensible collection management decisions. In times of stability, the past can be a good indicator of the future but in times of change, it is a poor one. Within the timeframe of most conservation challenges, it is reasonable to expect major changes, so it follows that the future is fundamentally unknowable.

With few exceptions (Ashley-Smith 2000; Taylor 2018), conservation offers little in response to uncertainty except to attempt to replace it with certainty or else define its parameters with confidence. Whilst uncertainty can be reduced by data collection and expertise it cannot be removed. When uncertainty is raised in western public discourse, it is usually characterised as a problem to be avoided or else ‘cured’ by strong management. Where preventive conservation does engage with uncertainty, it tends to be restricted to probability calculations and mapping upper and

lower limits of possibilities. It is necessary to go beyond this because such processes are mired with heuristic bias (Kahneman 2012) and because such boundaries are placed around already-known risks and tend to represent worst-case scenarios, inevitably excluding the unexpected. Increasing the options for managing uncertainty into preventive conservation ensures that the management and tolerance of residual uncertainty can complement more established risk management practices.

## Understanding uncertainty

### Complex and complicated contexts

When planning preventive conservation strategies and facing challenges that expose uncertainty it is useful to be able to distinguish contexts in which uncertainty is built in from those where it can be minimised. One indicator is recognising if a problem is complicated, yet a situation where actions can lead to predictable outcomes, or complex, where that cannot be assumed (Glouberman and Zimmerman 2002, 2). This can be illustrated as the difference between a clock mechanism (complicated) and a murmuration or airborne group of starlings (complex).

In a complicated system, if lever A is pulled outcome B happens. In a complex system, outcomes are unpredictable and are based on relationships. Complicated

situations can be investigated and resolved if sufficient resource is applied to the challenge. In complex systems, uncertainty is studied by considering agents (people), patterns and relationships. Complex systems can be rule-governed but those rules apply to how agents relate to each other, whether starlings or trustees. Recognising the context a problem is located in will guide the preventive conservator to the more effective route for investigation: normally a choice between an examination of physical and material rules or of social and political relationships.

### Definitions of uncertainty

Uncertainty is inevitable in a discipline concerned with future outcomes, but it is not a simple concept. An examination of the taxonomy of uncertainty reveals critical distinctions between forms of uncertainty that can be represented by probability or resolved by research and that which cannot. Table 1 captures a range of types of uncertainty with examples for preventive conservation contexts, demonstrating the scope and variability of uncertainty.

Recognising the range of types of uncertainty makes it evident that there is a need for a range of responses

to each type, appropriate to context. Exploring the known unknowns, statistical and epistemological uncertainties are areas of work well represented in preventive conservation with an ever more sophisticated grasp of risk management (Brokerhof and Kemp 2017) and cutting-edge research in decay of materials. Truth uncertainty may be managed by operating on the more cautious premise or by the methods for managing statistical and epistemological uncertainty.

Predicate, semantic and ethical uncertainties are managed by communication. Recognising these forms of uncertainty should trigger dialogue around values and consequences. In such discussions, the different emotional response to consequences of apparently similar magnitude in material terms might be exposed. Becoming aware that different stakeholders have different understandings or values allows the uncertainty to be managed.

Ontological and modal uncertainty deal with the unknown unknowns and are easy to ignore until the ignorance causes negative consequences. Identifying missing information is a feature of expertise (Klein 1999) so the involvement of experts reduces but does not eliminate this risk. It is not necessary to wait until a problem is identified to engage in creative

**Table 1.** Forms of uncertainty, from Hoogduin (2016), Lane and Maxfield (2005), Lander (2018) and Bradley and Drechsler (2013).

Type of uncertainty	Meaning	Example and remedy
Statistical / aleatoric / state / risk	Where uncertainty can be expressed as a probability or by distributions	Predictions of fire risk can be based on probability of occurrence and potential consequence. Formal risk management can utilise this assessment to inform investment to maximise potential benefit for collections
Epistemological / systematic / factual	Things we could know but don't	The response of a specific artefact to patterns of humidity. Research is an effective response
Truth	Not certain of the truth or otherwise of a given clearly defined premise. In some situations can be defined statistically	Not knowing if an item undergoing conservation is an original or replica. Cautious practice may be required
Semantic	Different experience of reality. Semantic uncertainty might be exposed when someone realises something they considered to be a reality is only a personal interpretation. This is a social issue for example where cultural bias masks colonial attitudes	A preventive conservation strategy based on an assumption that preserving the artefact is critical despite other people perceiving that preserving the skills of maintaining the artefact is what matters. Stakeholder engagement exposes semantic divisions creating the option to resolve them
Predicate	Indefinite but shared meaning	Predicate uncertainty could be used to describe differences in assumptions or practice between conservators from different specialisms, such as a creating a surrogate being seen as basic preventive conservation for books but as fakery for buildings. Communication exposes inconsistencies
Ethical / normative	Don't know how people will value consequences of actions. Some consequences may be seen as bad luck and others negligence. Even where the probability of an outcome is knowable the emotional response to it may be unknown	Damage arising from making an object available for handling might be seen as a small price for increased access or negligence in the care of the object. The uncertainty may only be exposed after the consequence. Dialogue and foresight may mitigate
Ontological	We don't know what we don't know. Ontological uncertainty exists whether it is recognised or not	In planning storage capacity for collection growth even where the usual patterns of growth are definable statistically there may be an ontological uncertainty of a donor secretly planning the gift of a large collection. Contingency plans may be sufficient
Modal / state space	Uncertainty about the possibilities or what could happen	Looking for preventive strategies from a narrow range of options such as mechanical control and being uncertain about other ways of working. Innovators may find new creative and previously unconsidered options
State / empirical	Uncertainty of the operating context, which may be expressed at different levels of severity	Not knowing what everything in the collections is made of. Identify things you don't know about the current situation
Effect	How the operating context might impact on your area of concern	Not knowing what will happen to the objects when you relax RH controls. Identify what you don't know about what will happen
Option	How the context will respond to changes you instigate/the consequences of actions	Not knowing if the new relaxed RH will be hailed as magnificent sustainability or woeful negligence. Identify what you don't know about how future events will impact on your concerns



and paradigm-challenging options appraisal although it is likely that the value of these alternative views will only be recognised by the mainstream when problems manifest themselves. Exploring these forms of uncertainty may engage conservators in identifying solutions that at present cannot be delivered. This kind of blue-sky thinking is fostered by innovative companies.

Uncertainty can be described in a temporal manner (state, effect, response), locating the uncertainty at different points in a chain of events. From the current state of things, through actions that might be taken and any response to such actions (Lander 2018) helping those planning preventive conservation to predict and manage uncertainty occurring at different points in a strategy.

### **Managing uncertainty**

Researching epistemological and statistical uncertainties is an essential preventive conservation task, however, looking beyond the 'collect more data' approach offers an additional range of approaches to managing and living with uncertainty. It is valuable to challenge the sense that everything is 'knowable'. Objects or collections can be described in terms like marble, glass or cellulose but this reveals little about other aspects of their significance which might be described in terms such as passion, shame, pride or fear. Being comfortable with uncertainty can help explore multiple perspectives (Similä and Eastop 2017) whereas striving to remove it may lead to conflict, with winners and losers.

Recognising semantic uncertainty helps identify contexts where embracing and delving into uncertainty is a constructive mode. Describing the meaning or value of an object is a human activity: attempting to codify this subjective, conflicting, changing and uncertain concept in the pursuit of a single numerical value for preventive conservation activities such as condition surveys is problematic. When conservators invite colleagues to describe (loss in) value as a numerical expression they find it 'frustrating' or provocative (Bullock 2012; Cannon et al. 2017). Whilst in many cases institutional values and frameworks can be simply interpreted by colleagues, there are pieces of contentious history which cannot adequately be described with a single narrative, with consequent implications for its care. Recognising that stakeholders have different views on the meaning, value and use of collections generates two options for preventive conservators: look for a route to end these differences and describe the 'winning' position, or accept difference and find new and perhaps as yet not envisaged modes to manage the multiple perspectives. Acceptance of ontological and modal uncertainty allows preventive conservators to commit to active uncertainty

management, capturing changing and conflicting values and ensuring there is a clear route for critical stakeholders to contribute.

Where a residual uncertainty exists and its scale cannot or has not been defined, shifting focus from describing the probability to accepting the possibility of it happening generates fresh management strategies. Preventive conservators can put in place buffers and redundancy to create time to react to unknown occurrences. These can range from money in a contingency budget, through to actual buffers such as absorbent bags for flood defence, or triple redundancy sensors. Having buffers and redundancy helps protect against the unknown unknowns. Conservators tend to be good at providing redundancy and buffers in fixtures and fittings but are inconsistent in creating procedural options for the unexpected. Prescriptive disaster planning increases the consistency of response in predicted emergencies but is less effective in unexpected ones (Ferraro and Henderson 2011). Accepting the certainty of unexpected events normalises them, encouraging team members to share and learn from the experience. Intriguingly accepting possibility may result in a reduction in probability. Klein (1999) describes a process of 'pre-mortem questioning' where prior to commencing an activity, participants imagine it has gone wrong and then ask why it did. *Pre-mortem* questions help develop management strategies for uncertainty.

Alertness and monitoring are tools of uncertainty management (Hoogduin 2016). Preventive conservators generally monitor threats effectively but they must also be alert to respond to both the opportunities and threats that the data reveals. Responsiveness requires imagination and creativity and is an essential feature of leadership. Recognising whether the monitoring data flags a problem of a complicated or complex nature helps identify solutions, for example, either seeking a solution in the settings on a piece of equipment, or finding out why someone changed the settings.

Those engaged in management of uncertainty utilise tools and theories to manage complex contexts built around the ability of people to influence their networks via modes of connection (Hoogduin 2016). These models consider patterns and relationships between people to illustrate phenomena such as new technology sweeping away what went before. People with more connections are most influential and tracking this influence requires identifying critical factors in their decision-making. Instead of attending to a specific act, fact or event, managing uncertainty becomes a process of observation and attention to people, their networks and their priorities. Finding out how people choose between options can be as simple as getting to know and respect colleagues. This can be described as investing in relationships

with 'generative potential' (Lane and Maxfield 2005). Via this relationship, the conservator can activate their connection's network when the unpredictable happens. Those who wish to influence future outcomes should ask who is likely to be influential in events. Increased communication will help identify cases of semantic and predicate uncertainty before they cause problems and by identifying different perspectives allow conservators to build strategies to manage them.

Whilst, in times of relative stability, thoughtful risk management will effectively support preventive conservation decisions, in times of change there is a need for innovators who are able to offer as-yet not possible nor conceived of solutions. Nurturing diversity in preventive conservation teams is a wise investment in this context. Risk intolerance in complex systems is unrealistic and recognising this may help conservators move between a precautionary approach in contexts where it is effective to a risk-tolerant, uncertainty management approach where it is not.

### Living with uncertainty

A move even further from the comfort zone of conservation professionals is living well with uncertainty. In this case, uncertainty is not reduced, replaced or managed by heuristics, it is tolerated because it cannot be avoided. This is something considered in medical contexts around life-threatening illnesses. Advice to patients suddenly aware of the uncertainty of their life chances and unable to control the outcome is summarised in Table 2. Strategies for living well with uncertainty focus on processes, setting goals, making a start and seeking positive achievements. With modal and state uncertainty it is not feasible to 'look before you leap' as the other side cannot be known. Instead, the only positive way to progress is to 'cross bridges as you come to them' (Bradley and Drechsler 2013). In preventive conservation, this may be seen as the contrast between conducting a full condition survey to understand a collection before trying to change it, and the *RE-ORG*

project which follows the *make progress against goals* model with site assessment leading quickly to delivering and celebrating achievements (UNESCO and ICCROM 2018).

Recognising the strained relationship between uncertainty and control is important. It is easy to become distracted and paralysed by issues beyond the individual or institution's control. Frustration and consequent inaction can arise from focusing on trying to manage the fundamentally uncertain. Advice in the medical context is to focus on small gains, on making a start and appreciating small things whilst not expecting to feel good all the time. This might be useful in a context such as planning preventive conservation for an exhibition where the object list is not available. Focusing on what can be controlled, creating positive occasions around small gains and setting processes in motion fully accepting that they may not all be used may help a preventive conservator to divert energy from frustration, to concentrate on forging positive outcomes.

Emotional responses are an important part of living with and managing uncertainty. Identifying how satisfactory a situation is might be vital in identifying not what might go wrong but how critical stakeholders will respond to such an event. This connection with ethical uncertainty raises questions such as: might a fire be considered unfortunate but loss of documentation negligent? Could the emotional interpretation of loss become a factor that managers reflect on in hindsight but which was not built into the risk management models? A conservator may have accurately predicted a 99% success rate from a management strategy which was corporately welcomed until the 1% occurrence happened. The effects of ethical uncertainty are not necessarily mitigated by the high quality of the management of the statistical uncertainty.

Validating emotional responses is a part of resolving semantic uncertainty. No emergency salvage operation will be joyous but managing emotions will be vital in the return to normal operations and the long-term well-being of those involved. Making time to focus on small victories may help cope with the magnitude of the situation. Endless concern with abstraction such as 'Why did this happen?' can be unproductive in the salvage phases following a disaster, whereas finding joy in detail can help make progress and ensure that conservators are conceived as productive co-workers. Emotions also offer a guide to activity and inactivity and it is known that emotion plays a stronger role in decision-making when levels of uncertainty are high (Faraji-Rad and Pham 2017). A sense that a decision is simply wrong can act as a vital warning even before a conscious rational for why it is wrong can be expressed. This alarm bell offers a chance to stop, investigate and reflect.

**Table 2.** Living with uncertainty (based on unpublished patient leaflet from Velindre Cancer Centre, Wales).

Strategies to live with uncertainty
Make goals and plans
Make a start
Focus on tasks and achievements
Routine and structure
Don't try to control it or ask for answers and solutions
Identify what you can control
Avoid auto-pilot and bad habits of thinking
Accept that sometimes things feel bad
Take a break from abstractions to notice and appreciate the small stuff
Put your energy into meaningful things
Make time for positive things

## Conclusion

Response to uncertainty might be prediction, reduction, tolerance and management. Increasing knowledge is one response to uncertainty and risk management brings uncertainty into collection management by careful consideration of likelihood and impact. Other forms of uncertainty require a more nuanced response using communication and redundancy to anticipate the unpredictable. Accepting and exploring differences through communication may result in conservators resolving predicate and semantic uncertainty with their colleagues by constructing new definitions of now more clearly shared concepts. At times certainty is used to mask the unknown and in so doing leaves practitioners less well prepared for unexpected events. A management framework that expects the unexpected and has strategies to respond will grow from the experience. Working practice can be guided by the unknown and be no less professional for so doing. An exploration of ideas beyond the conventionally described risk equation will bring innovation and creativity into problem-solving. Making space for uncertainty opens the door to discuss and negotiate ambiguity without the implied power relationships of knowledge and truth.

Preventive conservators are agents of the present and future use of collections. Our ethical duty in serving those needs supersedes any personal wish to appear to have all the answers.

## Disclosure statement

No potential conflict of interest was reported by the author.

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